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An Epidemiological Investigation of an Outbreak of Viral Hepatitis E at Ahmednagar, Maharashtra, India.

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ABSTRACT

Hepatitis E is an enterically transmitted viral disease, highly prevalent in India and mainly presents as a sporadic disease. This study investigated an outbreak of viral hepatitis at Ahmednagar Maharashtra, India. There was a rise in the number of viral hepatitis cases in a regimental training centre, Ahmednagar in May-Jun 2006 and an outbreak of viral hepatitis was suspected. The clinical case sheets and preliminary investigations carried out in the local military hospital (MH) were reviewed. A cross sectional descriptive epidemiological study was undertaken with survey of the suspected sewage and water pipelines. A total of 49 cases occurred from 12 May 2006 to 26 Jul 2006. There was clustering in time and space suggesting common source epidemic. All the 49 serum samples tested for IgM anti HEV antibodies were positive. Exploration of the water pipelines revealed sewage contamination due to leakage in the water pipeline which was passing through the sewage line. This water pipeline was laid illegally by the greedy canteen vendor to supplement water supply to his shop. The overall attack rate was 1.00%.The outbreak of viral hepatitis in the regimental training centre occurred due to sewage contamination of drinking water pipeline.

Keywords: Viral hepatitis E, Epidemiological investigation

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INTRODUCTION

Viral hepatitis caused by A and E viruses is the major public health problem in India. Out of six different types of viral hepatitis known (A, B, C, D, E, and G), hepatitis E virus (HEV) is the agent responsible for the hepatitis outbreak as well as sporadic cases of hepatitis in developing countries [1-3]. Although hepatitis A and hepatitis E both are highly endemic in India, HEV infection is responsible for most of the outbreaks. In India, HEV infection is responsible for 30-70% of the cases of acute and sporadic hepatitis [4]. Two common-source water-borne outbreaks and one series of endemic cases of hepatitis in three parts of India 69 serum pairs were tested for hepatitis A and hepatitis B virus infections. None of the patients had evidence of HAV infection and only 10.1% had evidence of HBV infection. A large proportion of hepatitis in India seems to be caused by previously unrecognized agents [5].

Increased incidence of Viral Hepatitis was reported from a Regimental Centre, Ahmednagar. 49 cases of Viral Hepatitis were admitted at Military Hospital Ahmednagar from 12th May 06 to 26th Jun-06.

Objectives

Epidemiological investigation was carried out due to increase incidence of Viral Hepatitis at a Regimental Centre, Ahmednagar.

The objectives were as follows

- To identify the etiological agent, source of outbreak, and mode of transmission.
- To suggest and implement control measures based on the outbreak investigation and make recommendation to prevent recurrences.

Verification of Diagnosis: The diagnosis was made on the basis of clinical picture and laboratory investigation. All patients were found to have raised serum Bilirubin and were found to have negative HBsAg. On further classification and typing of Virus, the virus was identified as Hepatitis 'E' Virus.

Confirmation of the Existence of an Outbreak: Ahmednagar is endemic for Viral Hepatitis and endemic incidence amongst individual undergoing training were observed during the years 2003, 2004, and 2005 varies from 9 to 15 cases. However, the incidence of 49 cases of viral hepatitis during the month of Jun 06 is indicative of a focal outbreak of the disease.

MATERIAL AND METHODS

Descriptive Epidemiology

An epidemic investigation was carried out in the Ahmednagar . We reviewed the annual IDSP report on acute viral hepatitis to confirm the outbreak (6). We searched cases by defining a case as an acute illness.

Case Definition

All cases which presented with fever, anorexia and yellowish discoloration of the eyes, followed by raised Bilirubin and liver enzyme levels in serum samples were defined as a case of Viral Hepatitis for the purpose of this investigation.

Data were collected through (1) A door-to-door survey and (2) Hospital records. Information regarding the date of onset, age, sex, place of residence, treatment, and laboratory investigation was collected. The distribution of cases was analyzed using time, place, and person characteristics

Analytical Epidemiology

We conducted a retrospective cohort study to test the hypothesis regarding the cause of the hepatitis outbreak. We divided the area into two cohorts on the basis of suspected exposure: (a) the area was supplied drinking water through leaking pipelines and there were overflowing drains; (b) The area was supplied with drinking water through pipelines without leakages. Then we identified people who developed the disease and who did not, among the exposed and non-exposed.

Epidemiological Case Sheet & Line-listing of Cases

An epidemiological case sheet was made and information recorded from the affected individuals with respect to personal particulars, date of onset of symptoms, presenting symptoms, date of hospital admission, history of movement/Travel in the 1-2 months preceding the onset of symptoms, details of individual and collective training activities, source of drinking water, history of eating from outside etc. All cases of viral hepatitis were line-listed and distribution of cases in time, place and person were analyzed to identify the possible source of infection.

Survey Team: comprised of the following:-

- Commanding Officer & Senior Community Medicine Advisor, Military Hospital , Ahmednagar.
- Regimental Medical Officer, Ahmednagar.
- Pathologist, Military Hospital, Ahmednagar
- Health Superintendent, Military Hospital, Ahmednagar.
- Assistant Garrison Engineer (water supply), Ahmednagar.

Environment Survey

Environment survey included survey of potential sites of food and water contamination, checking of seepage from sewage line and potential sites of cross contamination with water pipeline was carried out.

Collection of Laboratory Specimens

All the individuals reported with fever, malaise, fatigue and yellowish discoloration of eyes etc to RMO, were hospitalized, lab investigation done included Liver Function Tests, Haemogram and urine analysis etc. Serum samples were also forward for typing and classification of hepatitis virus. Water samples for bacteriological analysis were collected from all 14 suspicious water points identified at Ahmednagar. Water samples from the likely points of contamination were also brought for bacteriological examination.

Search for Additional Cases

All individual were presenting with fever, anorexia, malaise, fatigue and yellowish discoloration of eyes during the period were clinically examined and lab investigation undertaken at MH Ahmednagar to rule out the diagnosis of Viral Hepatitis.

Active surveillance was carried out by RMO, to identify any cases of Jaundice amongst individuals. OPD records of past one month in respect of individuals were analyzed for the incidence and pattern of diarrheal cases.

RESULTS

Incidence of Viral Hepatitis

The previous three years incidence of viral hepatitis at Ahmednagar is as given in Table No 1

It is seen from the that the sporadic cases of Viral hepatitis at a Regimental Centre, Ahmednagar amongst individuals have been occurring regularly especially during monsoon season. However, there has been abrupt rise in incidence in may-jun 2006.

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Population at risk

Out of 5576 population at risk, 49 cases occurred amongst 1577(see Table No 2) serving individuals.

Epidemiological Data: Distr of Cases in Time

Details are as given in table No 3. The incidence of Viral Hepatitis is seen to start from 12 May 2006 reached peak on 12 Jun 2006 and thereafter started declining till 26 Jun 2006.

Ecological Factors

Geography and Climate: The cases of Viral Hepatitis occurred at a Regimental Centre, Ahmednagar. The terrain consists of plain area with moderate vegetation. The temperature ranges from 20°-38° C with moderate rainfall from Jun to Sep.

Demographic Profile: Heterogeneous population from all parts of the country. The Cases were staying in five different locations.

Health Services: The med cover is provided by three RMOs and by Military Hospital Ahmednagar which also has a health section.

Water Supply

Water supply is provided by the MES from a pump house, and by water browsers which collect water from Ahmednagar Municipal Corporation pump house. Water supply is intermittent with occasional scarcity of water.

On initial visit, no free residual chlorine was found at consumer end, while only traces of free residual chlorine was found at Water pump house and in water supplied by water browsers. However on subsequent visit, adequate free residual chlorine was found at pump house and in water supplied by water browsers, but only traces of free chlorine was found at consumer points. Bacteriological examination of the water from the source and various consumer points was not carried out regularly. Water at cook houses is being stored in cemented/syntax tanks and stored in Matkas. For taking out water from tanks and Matkas, practice of dipping Jug/glass into them was being followed. Water coolers for drinking purpose have been provided in cook houses with Aqua guard but they are not able to meet the requirement so water form cemented and syntax tanks is being utilized.

Sewage Disposal

The sewage is disposed into septic tanks. Sewage blockage was observed in the sewage line.

Eating Establishments

Canteen Vendor Water is supplied to the juice bar through authorized tap, but an unauthorized water pipeline connection which is crossing through the sewage chamber, and also collection of sewage was observed around the water pipeline because of sewage block.

Analysis of Data: Clinical Data

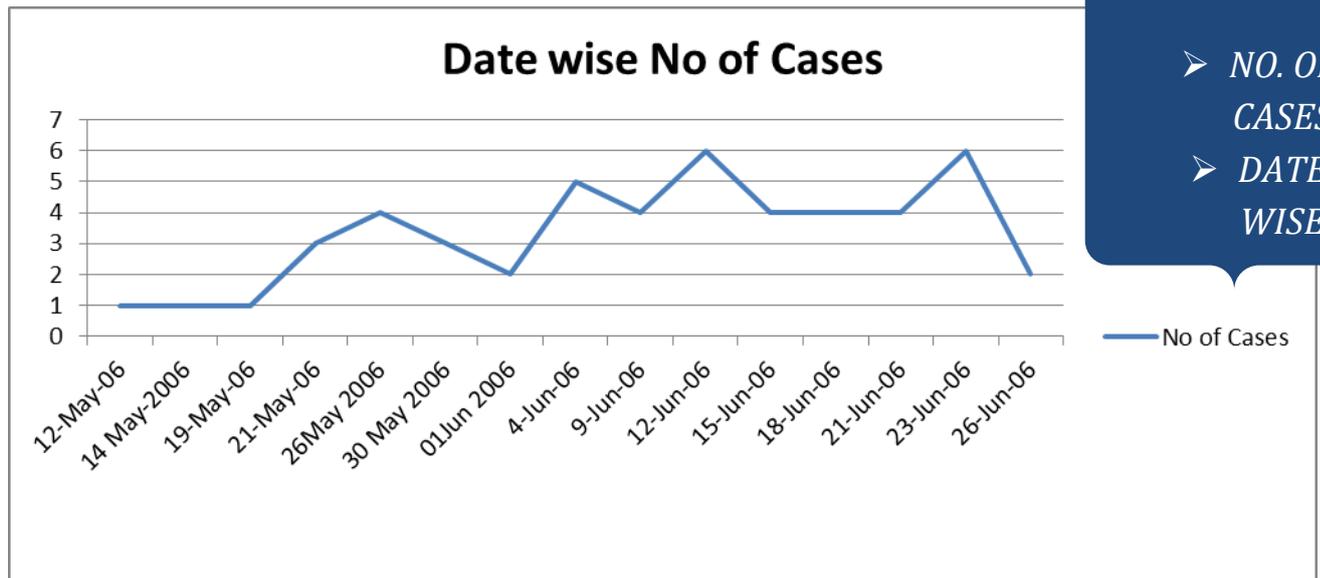
All individuals who were diagnosed as suffering from Viral Hepatitis, initially presented with mild to moderate grade fever with anorexia, malaise, yellowish discoloration of sclera and high coloured urine.

Laboratory Data

Blood samples obtained from the cases showed increased Bilurubin levels and all were HBsAg negative. On analysis of samples at Department of Microbiology for classification and typing, hepatitis 'E' Virus was detected.

Bacteriological examination report of water samples collected from 'were found to be unsatisfactory/ suspicious.

Figure No 1



Note: 49 individuals were diagnosed with Viral hepatitis from 12 May 2006 to 26 Jun-2006 . All the cases dine together in the same building with water source being the same (see figureNo 1)

History of Travel/Movement: None of the cases of Viral hepatitis gave any history of travel outside.
 The signs and symptoms included pain in abdomen (35%), anorexia (56%), malaise (32%), fever (39%), nausea (62%), vomiting (70%), icterus (100%), and yellow discoloration of urine (100%).
 In our study, it was a uni-modal outbreak with a single peak suggestive of a point-source, common-vehicle epidemic.

Table No 1: Incidence of Viral Hepatitis

Year	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
2003	-	-	01	-	01	02	-	02	01	02	-	-	09
2004	-	01	02	02	-	01	01	02	02	01	01	02	15
2005	01	02	-	01	04	-	01	-	01	-	01	-	11
2006	01	01	04	03	08	49	01	01	02	-	-	-	70

Note: It is seen from the above table (Table no 1) that the sporadic cases of Viral hepatitis at a Regimental Centre, Ahmednagar amongst individuals have been occurring regularly especially during monsoon season. There has been abrupt rise in incidence in may-jun2006.

Table No 2: Population at risk

SERVING INDIVIDUALS	CIVILIAN	SERVING INDIVIDUALS FAMILIES	Total
1577	1452	2547	5576

Note: Out of 5576 population at risk, 49 cases occurred amongst 1577(see Table No 2) serving individuals

Table No 3: Epidemiological Data: Distr of Cases in Time

Date of Hospital Admission	No of Cases
12 May2006	01
14 May-2006	01
19 May2006	01
21 May2006	03
26May 2006	04
30 May 2006	03
01Jun 2006	02
04 Jun 2006	05
09Jun 2006	04
12Jun 2006	06
15 Jun 2006	04
18 Jun 2006	04
21 Jun 2006	04
23 Jun 2006	06
26 Jun-2006	02
Total	49

Note; The incidence of Viral Hepatitis is seen to start from 12 May 2006 reahed peak on 12 Jun 2006 and thereafter started declining till 26 Jun 2006_(seeTable no 3).

DISCUSSION

Interpretation of Data

Comprehensive Picture of the Outbreak: The incidence of Viral Hepatitis was high compared to the previous three yrs morbidity. The incidence was 1.00% during the above mentioned period of three weeks.

The affected persons are mainly individuals with history of consumption of snacks from canteen during the last 1-2 month period.Sewage blockage with consequent sewage overflow forming a cesspool near canteen, and unauthorized water pipeline connection to canteen passing through sewage chamber, points to be a likely source of contamination.

The water samples from the canteen shop on the bacteriological analysis of water samples reveals coliform count indicating faecal contamination. In an another study of Haryana town, bacteriological examination report of water samples were found to be unsatisfactory/ suspicious with significant association of higher attack rates (4%) in ward of the town along with leakage in water distribution system running co-existent with open drains containing household waste and sewage; and absence of residual chlorine in water samples tested at household level established fecal contamination of water as the cause of the outbreak [7].

In a Pakistan study, estimates on demographic history of HEV showed that HEV has remained at a steady nonexpanding phase from around 1970 to the year 2005, in which it expanded explosively with the emergence of new HEV variants. In conclusion, the limited sensitivity of available assay (Abbott anti-HEV EIA) may be a concern in HEV diagnosis in

Pakistan. This study cautions that the dissemination of the variant strains to other areas of Pakistan may lead to explosive HEV outbreak [8].

In a study at Girdharnagar ward of Ahmedabad city 233 cases were identified (attack rate 10.9/1000) during March-September 2008, which was 10 times higher than that in previous data [10]. The epidemic of hepatitis E usually occurs in the unimodal outbreak with a highly compressed curve of incidence or is a prolonged epidemic with multiple peaks. In our study, it was a unimodal outbreak with a single peak suggestive of a point-source, common-vehicle epidemic. The age specific incidence was highest among 20-29 years age group (18.5/1000), similar to what was reported by another study [11-14].

The results of this investigation indicated that the outbreak was caused by the hepatitis E virus. The factors which contributed to this outbreak were leakages in drinking water pipelines and overflowing drains. The outbreak subsided after correction of these factors [9]. Hepatitis E outbreaks have been reported in urban areas whenever there is a break in the quality of water supplied including water chlorination [11,15,16]. Several studies had similar epidemiological features. Poor sanitation and densely populated slum favor not only the hepatitis E outbreak but also typhoid and cholera outbreak [3,17]. Fecal contamination of the source of drinking water was documented in many of the epidemics [3,4,11,13,14,17].

Probable Source of Outbreak

All cases have occurred in serving individuals staying at 5 different locations. Since most of the cases have occurred over a period of three weeks, it is a common point source outbreak. The possible source of outbreak is canteen as majority of cases reported having snacks from canteen. An unauthorized water pipeline to canteen was found passing through blocked sewage line where consequent to sewage overflow a cesspool was formed at the entry point of water pipe in to the canteen. The water samples from the canteen were showing frank sewage, the bacteriological analysis of water samples reveals coliform count indicating faecal contamination.

Control Measures Initiated

The following control measures are initiated

- Joint Surveillance of water quality intensified by taking samples for free residual chlorine and bacteriological examination.
- Survey of all the suspected areas of leakage from sewage and water pipelines has been done on 12 May-2006. Joint Surveillance of water and sewage pipeline was carried out. Sewage blockage was cleared,
- The unauthorized water pipeline to the canteen has been disconnected and canteen was closed.
- The super chlorination of water till the time outbreak is over and ensure adequate free residual chlorine at source and consumer end points.
- Cleaning of all water coolers and tanks.
- Active search for more cases .

- Health education of all person.

Recommendations

The following measures were recommended

- To maintain Joint Surveillance of water quality with daily chlorine check and various consumer points with weekly bacteriological examination. Super chlorination of water to be done till the outbreak is over.
- Joint Surveillance of water and sewage pipelines on daily basis by health authority and immediate rectification of defects to be carried out.
- Daily boiled water boiling for half an hour to be consumed, when in doubt.
- Implementation of Anti-fly measures.
- Health education of all people on water and food discipline as well as on personal hygiene.

CONCLUSION

Increased incidence of Viral Hepatitis was observed in a regimental Centre, Ahmednagar. The likely source of infection is Canteen where sewage contamination of water pipeline has been observed and majority of cases reported after having consumed water. The incubation period of Viral Hepatitis 'E' infection is two to nine weeks, so cases are expected to occur till the month of Aug 2006. It is recommended that regular Surveillance of the area and water quality to be maintained so as to prevent occurrence of any outbreak in future.

REFERENCES

- [1] Tandon BN, Gandhi BM, Joshi YK, Irshad M, Gupta H. Bull World Health Organ 1985;63:931-4.
- [2] Monthly Newsletter of National Institute of Communicable Diseases. Vol 4. Outbreaks of viral hepatitis E: Public health system needs to be alert. CD Alert, Delhi: National Institute of Communicable Diseases; 2000.
- [3] Sarguna P, Rao A, Sudha Ramana KN. Outbreak of acute viral hepatitis due to hepatitis E virus in Hyderabad. Indian J Med Microbiol 2007;25:378-82.
- [4] Acharya SK, Madan K, Dattagupta S, Panda SK. Natl Med J India 2006;19:203-17.
- [5] Doris Wonga, et al. The lancet 1980;316:876 – 879.
- [6] Annual report 2006. Ahmednagar: IDSP; 2006.
- [7] Prinja S, Kumar S, Reddy GM, Ratho RK, Kumar R. J Commun Dis. 2008;40 (4):249-54.
- [8] Khan A, Tanaka Y, Kurbanov F, Elkady A, Abbas Z, Azam Z. J Med Virol 2011;83(4):622-9.
- [9] Chauhan NT, Prajapati P, Trivedi AV, Bhagyalaxmi A. Indian J Community Med 2010;35: 294-7.
- [10] Labrique AB, Thomas DL, Stoszek SK, Nelson KE. Epidemiol Rev 1999;21:162-79.
- [11] Bhagyalaxmi A, Gadhvi M, Bhavsar BS. Indian J Community Med 2007;32:277-9.
- [12] Gurav YK, Kakade SV, Kakade RV, Kadam YR, Durgawale PM. Indian J Community Med 2007;32:182-4.



- [13] Das P, Adhikary KK, Gupta PK. Indian J Community Med 2007;32:84-5.
- [14] Sreenivasan MA, Banerjee K, Pandya PG, Kotak RR, Pandya PM, Desai NJ, Indian J Med Res 1978;67:197-206.
- [15] <http://www.who.int/emc>.
- [16] Banerji A, Sahni AK, Rajiva, Nagendra A, Saiprasad GS. Med J Armed Forces India 2005;61:326-9.
- [17] Khan JA, Agarwal RK, Majumdar A, Chadha S. Indian J Pract Doct 2006; 3:3-4.